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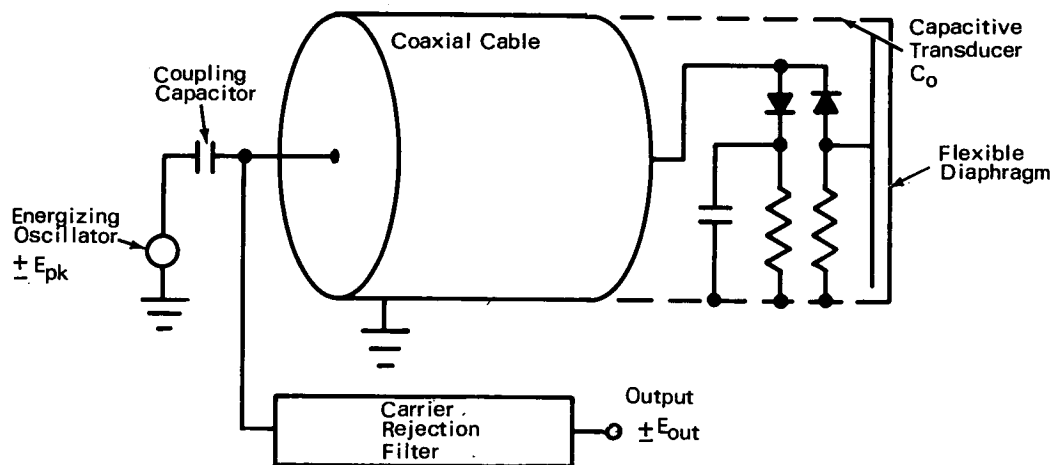
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Catheter Transducer and Circuit

The problem:

Provide an accurate output voltage for a static or dynamic change in capacitance (or resistance) over a wide temperature range. Minimize the number of components, and design the circuitry such that it is amenable to integration and the output is independent of cable effects, particularly capacity.

the bridge is varied, a corresponding voltage is produced on the coupling capacitor. The addition of the carrier-rejection filter, which blocks the driving frequency, enables the transducer signal to be measured at the input. The circuit sensitivity, $(\Delta E_{out}/E_{pk})/(\Delta C/C_0)$, can be optimized to changes in capacitance by adjusting the oscillator frequency to approximately



Circuit Diagram

The solution:

Utilize a simple integrated circuit located at the transducer, to enable using a single coaxial cable for both the input and output connections. The circuit is sensitive to changes in the RC time constant, has much improved sensitivity characteristics, and is unaffected by changes in cable capacitance effects.

How it's done:

The circuit (see fig.) is relatively simple, and consists of an energizing oscillator, a coupling capacitor, a coaxial cable, and a diode impedance bridge. When one of the capacitors (or resistors) of

1/3 RC. Sensitivities as high as 0.5 can be realized with this circuit, using a pulse waveform.

Values of R and C can be chosen to be compatible with present hybrid and monolithic integrated circuit (IC) techniques. Hybrid IC versions of the circuit have been successful in a 0.114 cm (0.045 in.) diameter capacitance type heart-catheter manometer, providing a sensitivity of 1 mV per 133 N/m² (1 mm Hg) change in pressure. Similar applications of a hybrid IC to 0.64 cm (0.25 in.) diameter wind-tunnel pressure transducers over a wide range of pressure have been very successful.

(continued overleaf)

In general, the circuit can be used to sense changes in nearly all types of capacitance (or resistance) transducers.

Notes:

1. A related innovation is described in NASA Tech Brief B67-10669.
2. Requests for further information may be directed to:

Technology Utilization Officer
Ames Research Center
Moffett Field, California 94035
Reference: TSP71-10234

Patent status:

This invention has been patented by NASA (U.S. Patent No. 3,545,275), and royalty-free license rights will be granted for its commercial development. Inquiries about obtaining a license should be addressed to:

Patent Counsel
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